a modulator responsive to said space time-encoder,

pulse shaping circuitry responsive to said modulator, and

at least two antennas for transmitting a space-time coded signal created by said space-time encoder, modulated by said modulator, and conditioned by said pulse shaping circuitry.

5. The transmitter of claim **4** where said demultiplexer develops an L plurality of signal streams, where said channel coders in said L channel coding/space-time coding transmitters develop rates R_i i=1,2,...,L, that are not identical to each other.

6. The transmitter of claim **4** where said demultiplexer develops an L plurality of signal streams, where said channel coders in said L channel coding/space-time coding transmitters develop rates R_i i=1,2,...,L, that are such that $R_1 > R_2 > \cdots > R_L$.

7. The transmitter of claim **3** where said channel code encoder performs trellis encoding.

8. The transmitter of claim **3** where said channel code encoder performs convolutional encoding.

15. A transmitter comprising:

a demultiplexer responsive to an applied input signal for developing an L plurality of at least two signal streams, and

a like plurality of channel coding encoders, each responsive to a different one of said plurality of signal streams,

a like plurality of a space-time coding transmitters, each responsive to a different one of said channel coding encoders.

16. The transmitter of claim **15** where each of said space-time coding transmitters comprises:

a space-time encoder responsive to input signal of said space-time coding

transmitter,

a modulator responsive to said space time-encoder,

pulse shaping circuitry responsive to said modulator, and

at least two antennas for transmitting a space-time coded signal created by said space-time encoder, modulated by said modulator, and conditioned by said pulse shaping circuitry.

17. The transmitter of claim **15** where each channel coder $i=1,2,...,L$ in said L plurality of channel coders develops codes at rate R_i, and the rates for different values of index i are not identical to each other.

18. The transmitter of claim **17** where said demultiplexer develops an L plurality of signal streams, where said channel coders in said L channel coding/space-time coding transmitters develop rates R_i $i=1,2,...,L$, that are such that $R_1 > R_2 > \cdots > R_L$.

19. The transmitter of claim **17** where said demultiplexer develops an L plurality of signal streams, where said channel coders in said L channel coding/space-time coding transmitters develop rates R_i $i=1,2,...,L$, that are such that $R_1 < R_2 < \cdots < R_L$.

20. The transmitter of claim **15** where said channel code encoder performs trellis encoding or convolutional encoding.

REMARKS

In the last Office action response, two of paragraph amendments and one claim were printed with an error. The undersigned uses the Microsoft WORD 2000 word processing application, coupled with an equation editor supplied by MathType. It is a good equation editor but, recently, the undersigned discovered that, in connection with certain mathematical symbols, the HP Laserjet4 printer fails to print that which the computer monitor displays. Consequently, while the file is correct, and appears correctly on the computer monitor, the printer introduces an error. This is what happened in the

instant case. Applicants apologize for the problem and herein force the printer to print in a "TrueType" fonts as graphics mode. Alas, this setting cannot be set permanently.

With the current corrections, it is believed that the objection to the specification has been overcome, as well as the rejection of 19 under 35 USC 112, second paragraph, and as the rejection of claims 5,6, and 17-19 under 35 USC 112, first paragraph.

Claims 3, 4, and 7 were rejected under 35 USC 102(e) as being anticipated by Calderbank et al, US Patent 6,127,971 (henceforth, the '971 reference). Applicants respectfully traverse.

In connection with claim 3, the Examiner establishes the grouping of encoder 110, transmitters 110-1, and 110-2; encoder 120, transmitters 120-1, 120-2, and 120-3; and encoder 130 and transmitter 130; and then asserts a correspondence between the groupings and the "channel coding/space-time coding transmitters" of claim 3. Since the transmitters disclosed in the reference do no coding, it is left to the encoders to provide the functionality specified by the "channel coding/space-time coding" adjective.

Claim 3 is amended herein to clearly indicate that the "like plurality" of elements to which the signals developed by the demultiplexer are applied are not transmitters with merely a curios name. To that end, the second clause of claim 3 now specifies that each of the channel coding/space-time coding transmitters is "responsive to a different signal stream of said plurality of signal streams," and that each is "carrying out channel coding followed by space-time coding." Thus, amended claim 3 clearly requires an element that performs channel coding and, following that, performs space-time coding.

Referring explicitly to the references, in col. 4, line 45 et seq., the '971 reference states:

> More specifically, each string B_k is encoded by a space-time encoder C_k, which develops n_k symbols, and the encoded signal is transmitted by group G_k of the transmitting antennas. This gives a total of n sequences of constellation symbols that are transmitted simultaneously from the n transmitting antennas.

This passage clearly indicates that the encoders perform space-time coding. Also, in column 6, line 56, the sentence starts with:

> "If the code C_1 is a space-time trellis code, then ...",

which indicates that the encoders can be space-time trellis coders. However, there is no teaching in the '971 reference of channel coding followed by space-time coding (be it trellis or not). Consequently, it is respectfully submitted that claim 3 is neither anticipated nor made obvious by the '971 reference.

Regarding claim 4, the Examiner asserts that encoder 110 encodes the signal in "according to a trellis code C1 and develops two symbols," that encoder 120 encodes the signal in "according to a trellis code C2," and that encoder 130 encodes the signal in "according to trellis code C3." The Examiner then goes on to conclude that encoders 110, 120, and 130 include "a channel encoder and a space-time encoder." Applicants respectfully disagree. There is no indication in the '971 reference that there are two separate coders in any one signal path and, therefore, one cannot find a first coder that one can designate as the channel coder of claim 4, and a following coder that one can designate as a space-time coder. Consequently, one cannot even assess whether such designation might be appropriate. Accordingly, it is believed that claim 4 is neither anticipated nor made obvious by the '971 reference.

Regarding claim 7, applicants respectfully submit that the above remarks regarding claims 3 and 4 apply with equal force to claim 7, demonstrating that claim 7 is neither anticipated nor rendered obvious by the '971 reference.

Claims 3 and 8 were rejected under 35 USC 102(e) as being anticipated by Kotzin et al, US Patent 6,173,005 (henceforth, the '005 reference). Applicants respectfully traverse. The Examiner points to elements 304, 803, 806, and 808 in FIG. 8 of the '005 reference to support his assertion, pointing out that element 803 corresponds to the demultiplexer of claim 3. However, since signals reach element 304 first, then element 803, and then elements 806 and 808, it is respectfully submitted that the proper characterization is that *the '005 reference describes a first stage coder, followed by a demultiplexer, which in turn is followed by a plurality of second stage coders*. Whether the first stage coder is a channel coder and the second stage coder is a space-time coder (or vice versa) is immaterial because amended claim 3 specifies a demultiplexer that is followed by elements, the elements being effectively in parallel, where each element "each carrying out channel coding followed by space-time coding." That is not what '005 reference describes, and it is not even what the Examiner asserts. Even if the

Examiner were to argue now that a channel coder followed by a space time coder is shown, albeit with an interposed demultiplexer, applicants' response would be that the demultiplexer of claim 3 would then be interconnected differently than in the reference. It is also noted that the statement in the cited line 3 of col. 14 is that FIG. 8, rather than some element thereof, "provides a form of time-space coding which also improves the performance of the decoder in the mobile station." col. 14, lines 3-5. It is respectfully submitted, therefore, that claim 3 is neither anticipated nor rendered obvious by the '005 reference.

As for claim 8, it specifies that the channel coder performs convolutional encoding. The Examiner asserts that element 304 of the '005 reference performs convolutional encoding. Even if that were the case, it does not change the fact that, *structurally*, the arrangement is different. Hence, it is respectfully submitted that claim 8 is neither anticipated nor rendered obvious by the '005 reference.

Claims 15 and 20 were rejected under 35 USC 102(e) as being anticipated by Raleigh et al, US Patent 6,144,711 (henceforth, the '711 reference). Applicants respectfully traverse.

Pointing to FIG. 21 of the reference, the Examiner asserts that the TSW units are space-time coders. Respectfully, they are not. A TSW element takes a signal unit, and multiplies this signal unit by specific constants and then applys it to a plurality of antennas. What the unit does is, basically, beam forming. It focuses a signal in a particular **spatial direction**, providing better reception along that spatial direction. There is no mixing, and inter-relating of a signal between different antennas, and different instances of time, as is the essence of space-time coding. Hence, the TSW units of the '711 reference are not space-time encoders in the sense used in the application, or in the sense used in the art.

In contradistinction, claim 15, and claim 20 through its dependency on claim 15, specify space-time coding transmitters. Hence, it is respectfully submitted that the '711 reference neither anticipates claims 15 and 20, nor renders them obvious.

Claim 8 was rejected under 35 USC 103 as unpatentable over the '971 reference. Applicants respectfully traverse. The limitation introduced in claim 8 does not rectify the structural deficiency of the reference relative to claim 3, from which claim 8 depends,